

WHAT IS CLAIMED IS:

1. An ultrasonic diagnostic device comprising:

an echo data obtaining unit for transmitting and receiving  
5 an ultrasonic wave to and from a three-dimensional space including  
a target tissue and obtaining three-dimensional echo data for each  
time phase;

a displacement information creator unit for creating  
displacement information by calculating an amount of displacement  
10 for each site on the surface of the target tissue based on the  
three-dimensional echo data for each of the time phases;

a displacement-present image formation unit for forming, based  
on the three-dimensional echo data and the displacement information,  
a three-dimensional displacement-present image in which  
15 displacement of each site on the surface of the target tissue is  
shown on a tissue image three-dimensionally representing the target  
tissue;

a two-dimensional display image formation unit for projecting  
the three-dimensional displacement-present image onto a plane to  
20 form a two-dimensional display image; and

a display for displaying the two-dimensional image.

2. An ultrasonic diagnostic device according to Claim 1, further  
comprising:

25 a reference identifier unit for identifying, based on the  
three-dimensional echo data for each of the time phases, a reference  
point based on the structure of the target tissue, wherein

the displacement information creator unit calculates a distance between each site on the surface of the target tissue and the reference point based on the three-dimensional echo data for each of the time phases and calculates the amount of displacement  
5 based on a change in the distance between time phases.

3. An ultrasonic diagnostic device according to Claim 2, further comprising:

a straight line setting unit for setting a plurality of straight  
10 lines extending along a radial direction from the reference point which is the center of mass of the target tissue, wherein

the displacement information creator unit calculates a position of an intersection between each of the straight lines and the surface of the target tissue based on the three-dimensional  
15 echo data for each of the time phases and calculates the amount of displacement based on a change in the position of the intersection for the same straight line between time phases.

4. An ultrasonic diagnostic device according to Claim 3, wherein  
20 the displacement-present image creator unit applies a coloring process to each of the sites on the tissue image based on the amount of displacement of that site to form the three-dimensional displacement-present image.

25 5. An ultrasonic diagnostic device according to Claim 4, wherein the coloring process is a coloring process using colors absolutely determined for the amount of displacement of each site.

6. An ultrasonic diagnostic device according to Claim 4, wherein  
the coloring process is a coloring process using a color  
determined based on a relative magnitude of the amount of  
displacement in each site with respect to the amounts of displacement  
5 of the plurality of sites.

7. An ultrasonic diagnostic device according to Claim 4, wherein  
the two-dimensional display image is formed by projecting the  
three-dimensional displacement-present image onto a plane using  
10 a volume rendering method.

8. An ultrasonic diagnostic device comprising:  
an echo data obtaining unit for transmitting and receiving  
an ultrasonic wave to and from a three-dimensional space including  
15 a target tissue and obtaining three-dimensional echo data for each  
time phase;

a reference point identifier unit for identifying a reference  
point corresponding to the structure of the target tissue based  
on the three-dimensional echo data for each of the time phases;  
20 a movement calculator unit for calculating an amount of  
movement of the target tissue between the time phases based on the  
identified reference point;

a displacement information creator unit for creating  
displacement information by correcting the amount of movement based  
25 on the three-dimensional echo data for each of the time phases and  
calculating an amount of displacement for each site on the surface  
of the target tissue;

a displacement-present image formation unit for forming a three-dimensional displacement-present image in which the amount of displacement of each site on the target tissue surface is represented on a tissue image which three-dimensionally represents the target tissue, based on the three-dimensional echo data and the displacement information;

a two-dimensional display image formation unit for forming a two-dimensional display image by projecting the three-dimensional displacement-present image onto a plane; and

a display for displaying the two-dimensional display image.

9. An ultrasonic diagnostic device which:

transmits and receives an ultrasonic wave to and from a three-dimensional space including a target tissue to obtain three-dimensional echo data for each time phase;

creates displacement information by calculating an amount of displacement for each site on the surface of the target tissue based on the three-dimensional echo data for each time phase;

forms a three-dimensional displacement-present image in which an amount of displacement of each site on the target tissue surface is represented over a tissue image which three-dimensionally represents the target tissue, based on the three-dimensional echo data and the displacement information; and

forms a two-dimensional display image by projecting the three-dimensional displacement-present image onto a plane and displays the formed two-dimensional display image.

10. An ultrasonic diagnostic device according to Claim 9, which further:

identifies, based on the three-dimensional echo data for each of the time phases, a reference point based on the structure of  
5 the target tissue, wherein

the ultrasonic diagnostic device calculates a distance between each site on the surface of the target tissue and the reference point based on the three-dimensional echo data for each of the time phases and calculates the amount of displacement based on a change  
10 in the distance between the time phases.

11. An ultrasonic diagnostic device according to Claim 10, which further:

sets a plurality of straight lines extending along a radial  
15 direction from the reference point which is a center of mass of the target tissue, wherein

the ultrasonic diagnostic device calculates a position of an intersection between each of the straight lines and the surface of the target tissue based on the three-dimensional echo data for  
20 each of the time phases and calculates the amount of displacement based on a change in the position of the intersection for the same straight line between the time phases.

12. An ultrasonic diagnostic device according to Claim 9 wherein  
25 a coloring process is applied to each of the sites on the tissue image based on the amount of displacement of that site, to form the three-dimensional displacement-present image.

13. An ultrasonic diagnostic device according to Claim 12, wherein the coloring process is a coloring process using a color absolutely determined for the amount of displacement of each site.

5 14. An ultrasonic diagnostic device according to Claim 12, wherein the coloring process is a coloring process using a color determined based on a relative magnitude of the amount of displacement in each site with respect to the amounts of displacement of the plurality of sites.

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15. An ultrasonic diagnostic device according to Claim 9, wherein the two-dimensional display image is formed by projecting the three-dimensional displacement-present image onto a plane using a volume rendering method.

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